RESEARCH

Pharmacists' Expectations for Entry-level Practitioner Competency

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Objective. To determine if defined subgroups of pharmacists' have variability in their expectations for competency of entry-level practitioners.

Methods. Rating scale data collected from the 2009 National Pharmacy Practice Survey were analyzed to determine to what extent pharmacists' degree, practice setting, and experience as a preceptor were associated with the ratings they assigned to 43 competency statements for entry-level practitioners. The competency statements determine the content on the North American Pharmacist Licensure Examination (NAPLEX).

Results. Pharmacists with a doctor of pharmacy (PharmD) degree rated the competency statements higher in terms of criticality to entry-level practice than did those with a bachelor of science (BS) degree ($p < 0.05$). Pharmacists working in inpatient settings gave slightly higher ratings to the competency statements than did pharmacists working in outpatient settings, pharmacists without direct patient care responsibilities, and those in academia. However, there were no significant differences among practitioner subgroups' criticality ratings with regard to practice setting. Preceptor pharmacists' criticality ratings of the competency statements were not significantly different from those of non-preceptor practitioners.

Conclusion. Pharmacists exhibited a fair amount of agreement in their expectations for the competence of entry-level practitioners independent of their practice sites and professional roles. As the pharmacy profession embraces patient-centered clinical practice, evaluating practicing pharmacists' expectations for entry-level practitioners will provide useful information to the practitioners and academicians involved in training future pharmacists. Stakeholders in pharmacy education and regulation have vested interests in the alignment of the education of future practitioners with the needs of the profession.

Keywords: pharmacist, NAPLEX, competency, performance standards

INTRODUCTION

Performance on examinations serves as one of the criteria that licensing regulators use to make decisions about entry into professional practice. Licensing and certification entities routinely use tests to assess the knowledge, skills, and abilities of individuals in relation to their prospective area of practice.¹ The inferences made from an individual's score on a test should align with that individual's abilities to apply knowledge and skills in practice.² In addition, the societal implications of invalid interpretations and use of test scores are of paramount concern to licensing and certification organizations, whose objectives include gaining (and maintaining) the public's trust in their respective professions.³ An integral component of the test development process in licensing

and certification is to ensure the relatedness of examination content to job/performance tasks.^{4,5} To accomplish this, test developers routinely conduct practice analyses to link the content in a credentialing test to performance tasks in the occupational field.

During the second and third quarters of 2009, the National Association of Boards of Pharmacy (NABP) conducted The National Pharmacy Practice Survey of pharmacist practitioners and academicians to identify the knowledge, skills, and abilities expected of pharmacists entering the profession. Participants rated an array of recently reviewed and revised competency statements identified as essential for entry-level pharmacy practice. The competency statements are nationally recognized performance standards as set forth in the North American Pharmacist Licensure Examination (NAPLEX) blueprint.⁶ NABP analyzed the survey data for the sole purpose of obtaining measures of criticality and frequency for individual competency statements and translating those measures into content weights for the NAPLEX

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blueprint. This process determines the distribution of content in every NAPLEX administration.

The purpose of this study was to determine whether defined subgroups of pharmacists held different views regarding the criticality of the various competencies for pharmacy practice using the data collected in the 2009 National Pharmacy Practice Survey. Specifically, to what extent do pharmacists' degree, primary area of practice, and experience as preceptor to advanced pharmacy students predict the ratings that they assigned to competency statements for entry-level practitioners?

Previous studies that examine the expectations for practitioner competency based on job incumbents' responses to a survey of practice are limited. Studies show that pharmacists earning a PharmD degree are more likely to practice in an inpatient setting than their baccalaureate counterparts.^{7,8} With regard to job tasks and the distribution of responsibilities, Barnett and Matthews reported that there were no significant differences between BS and PharmD (first degree) pharmacists. However, pharmacists who attained a post-baccalaureate PharmD were more likely to be involved in professional activities related to education and administration, as opposed to medication dispensing functions.⁹ As the standards for pharmacy education continue to shift toward patient-centered, clinical pharmaceutical services, the primary functions of pharmacists in practice appear to continue to center on the dispensing of medication.¹⁰

METHODS

An analysis of the 2009 National Pharmacy Practice Survey data was conducted to determine pharmacists' expectations for competency of entry-level practitioners. Because this analysis sought to determine whether differences in criticality ratings were associated with pharmacists' degree, practice setting, or preceptor experience, it is important to explain how the NABP recruited the practitioners, administered the survey, and processed the data gathered in the National Pharmacy Practice Survey. The research contained herein was submitted to the Office for the Protection of Research Subjects for review by the Institutional Review Board and was determined to be exempt.

National Pharmacy Practice Survey

In recruiting participants for the National Pharmacy Practice Survey, the NABP identified US pharmacists from 3 primary sources: an NABP-supported internal database of pharmacists, a sample of pharmacy practice faculty members, and pharmacists who were recent providers of experiential education (designated as preceptors) to advanced pharmacy students (the latter 2 groups

supplied by the American Association of Colleges of Pharmacy). NABP solicited over 7,000 US pharmacists employed in various practice environments to participate in the survey. The NABP requested that the directors of experiential education forward the invitation to participate in the practice survey, to their respective lists of preceptors. Because of the unknown number of distributed invitations, the actual response rate could not be determined. However, the NABP would have stratified the sample of pharmacists responding to the survey if it had reflected an extreme departure from known demographics of the pharmacist population.

In a collaborative venture to assess and compare practice in the United States and Canada, the National Association of Pharmacy Regulatory Authorities mailed Canadian pharmacists an invitation to participate in the NABP survey. Previous joint practice analyses showed that Canadian and US pharmacists assigned similar ratings to competency statements, suggesting parallel practice standards in both countries. Approximately 9,800 Canadian pharmacists received an invitation to voluntarily participate in the survey.

The 2009 National Pharmacy Practice Survey was available online from April to mid-July via an Internet-based survey instrument, Zoomerang (SurveyMonkey, Palo Alto, CA). Pharmacists rated 43 competency statements using 2 scales (Appendix 1): criticality and frequency. On both scales, pharmacists assigned ratings from 1 (low) to 5 (high).

A total of 2,958 pharmacists completed the survey instrument (2,244 from the United States and 714 from Canada). The aggregate data revealed that some of the pharmacists did not indicate licensure in either the United States or Canada, and thus did not meet the criteria of (1) currently licensed to practice in the United States or Canada, and (2) actively practicing or engaged in the education of pharmacists. This resulted in the elimination of 93 sets of ratings. The analysis utilized all of the remaining data.

An analysis of the 2009 National Pharmacy Practice Survey data was conducted using the criticality ratings for each competency statement as the outcome measure and pharmacy degree, practice setting, and preceptor experience as predictor variables. Appendix 2 contains a description of the model variables. HLM 6 (Scientific Software International, Chicago) was used to analyze the data.

We used a multilevel (2-level), hierarchical generalized linear model (HGLM) with a nested structure (ie, pharmacists were nested within the predictor variables of degree, practice setting, preceptor experience). The model accounts for violation of the assumption that the

level-1 (competency) ratings are normally distributed, given the multi-categorical/ordinal response options.¹¹

There were distinct advantages to using a hierarchical approach to analyze the data set rather than more traditional statistical approaches such as ANOVA, ANCOVA, or multiple regression. Use of those time-honored approaches requires that certain rigorous assumptions regarding the distributions of the pharmacist subgroups' ratings be met (eg, independence of cases, variables are normally distributed, assumption of homoscedasticity). By contrast, hierarchical linear modeling rests upon far less restrictive distributional assumptions, making it a much more flexible approach for analyzing rating data.¹² Hierarchical linear modeling explicitly takes into account the nested structure of the data, facilitating the disentangling of individual and group effects on the outcome variable.¹³

Given a rating scale with $M = 5$ ordered categories; we modeled the probability of a pharmacist assigning a criticality rating in a given category to a competency in the following manner:

Formula 1

$$\begin{aligned}\varphi_1 &= \text{Prob}(R = 1) = \text{Prob}(\text{"Not serious"}) \\ \varphi_2 &= \text{Prob}(R = 2) = \text{Prob}(\text{"Minimally serious"}) \\ \varphi_3 &= \text{Prob}(R = 3) = \text{Prob}(\text{"Moderately serious"}) \\ \varphi_4 &= \text{Prob}(R = 4) = \text{Prob}(\text{"Highly serious"}) \\ \varphi_5 &= \text{Prob}(R = 5) = \text{Prob}(\text{"Critically serious"})\end{aligned}$$

where R is the rating scale category, and φ is the probability of a pharmacist assigning a competency statement a rating in that category.

Level-1 model. The level-1 model represents the relationship between the pharmacists who responded to the survey and their ratings. The Level-1 equation shows the log probability of a pharmacist assigning a criticality rating in a given category to a competency statement as a function of the sum of the intercept β_0 and slope parameters β_{1j} to β_{42j} for each competency:

Formula 2

$$\log \left[\frac{P_{ij}(R \leq m)}{P_{ij}(R > m)} \right] = \beta_{0j} + \beta_{1j}(C_1) + \beta_{2j}(C_2) + \dots \beta_{42j}(C_{42})$$

where $i = 1, \dots, 42, j = 1, \dots, 2,958, m = 1, \dots, 4, \beta_{0j}$ is the pharmacists' expectation levels for entry-level practitioners when rating competencies, and β_{1j} to β_{42j} is the measure of criticality on the competency. To ensure a full design matrix, we designated competency statement 43 as the reference competency and set its criticality measure to zero. In the level-1 model, the probability of a pharmacist

assigning a criticality rating in each of the categories was a function of the level of severity the pharmacist exercised and the criticality of the competency at level-1.

Level-2 model. The level-2 equation extended the model to include a set of covariates of interest, which provided information regarding the degree of association between each covariate and the level of severity a pharmacist exercised when rating the competencies. The level-2 equation was:

Formula 3

$$\begin{aligned}\beta_{0j} &= \gamma_{00} + \gamma_{01}(\text{DEGREE}) + \gamma_{02}(\text{INPATIENT}) \\ &+ \gamma_{03}(\text{OUTPATIENT}) + \gamma_{04}(\text{ACADEMIC}) \\ &+ \gamma_{05}(\text{PRECEPTOR}) + u_{00}\end{aligned}$$

where the random effects u_{00} represented the departure of each pharmacist's severity from the average expectation level γ_{00} . At level-2, each intercept was a function of degree, practice setting, academic designation, and preceptor experience. We designated BS degree, no-patient practice setting, non-academician, and non-preceptor as the reference groups. By setting the average expectation level to zero (baseline), we accomplished a full matrix design.

HGLM handles missing data in different ways, depending on the level of the model. The data set used for this analysis had missing data at level-1. The level-1 missing data resulted from an omission in the initial online survey of competency statement 41. The omission of the competency statement resulted in approximately 31% of the US pharmacists' ratings omitted for that particular competency. HGLM can handle missing data at level-1, and the model ran without any adjustments.

RESULTS

Response data from 2,986 pharmacists were included in this study. All pharmacists completed the survey instrument in its entirety with the exception of the aforementioned data point omission.

The estimated reliability for the intercept (β_0) for the competency statements (level-1 estimates) was 0.969. This is the ratio of the true parameter (intercept) variance to the observed variance (true + error). The reliability estimate is a useful measure that provides confidence in the parameter estimate represented in this data set, given the small amount of observed variance. The variance among the regression intercepts for each level-1 unit is small. The estimated variance component for the regression errors was 1.25, which was significant ($p < 0.0001$). This finding indicates that there were differences among the competencies in terms of how critical to entry-level practice the pharmacists considered them to be. The

measures (coefficients) obtained in the analysis are represented on a cumulative logit scale, which provides a metric for interpreting the results. The scale is in log-odds, or “logit” units, which, under the model, constitutes an equal-interval scale. The distribution of criticality measures ranged from 0.118 to 2.63 logits, indicating fairly wide variability in ratings.

Table 1 provides a summary of the results showing the average estimated coefficients for various pharmacist subgroups. Overall, pharmacists with a PharmD degree assigned higher ratings to the competencies (judged them more critical to entry-level practice) than did pharmacists with a BS degree. The difference between the 2 pharmacist subgroup measures was significant at the 0.05 level.

In terms of practice setting, pharmacists working in inpatient settings rated the competencies expected for entry-level practice somewhat higher (ie, more critical) than did pharmacists working in outpatient settings, and no-patient (reference) settings. Similarly, academicians’ ratings of criticality were higher than those by non-academics. Unexpectedly, preceptor pharmacists did not rate the competencies any higher (or lower) than non-preceptors did. However, none of the differences in subgroup measures related to practice setting and preceptor experience were significant, which suggests that the pharmacists exhibited a fair amount of agreement in their views regarding how critical the competencies were for entry-level practitioners.

DISCUSSION

The results from this analysis provide useful information regarding incumbent pharmacists’ expectations for entry-level practitioners. Pharmacists’ expectations for entry-level practitioners appear to be independent of practice sites and professional roles. These results reinforce the breadth and depth of pharmacy education and the importance of preparing future pharmacists for a variety of practice environments. This study could serve as a benchmark for the profession as it evaluates the alignment of educational requirements essential for

entering the profession with standards of practice. Additionally, as pharmacy educators prepare future generations of practitioners, it will be necessary for leaders in pharmacy education, regulation, and practice to share their vision of the profession. Studies investigating potential employers’ expectations for entry-level pharmacists’ knowledge and skills will be valuable in support of that vision.

The methodology used to solicit pharmacists to participate in the survey may have resulted in selection bias. Consequently, the sample of pharmacists completing the survey instrument may not have been representative of the population of practicing pharmacists.

In 2009, the Pharmacy Manpower Project, Inc., conducted the National Pharmacist Workforce Survey to evaluate demographic information and workplace impact of the pharmacist workforce.¹⁴ The sample populations represented in the 2009 National Pharmacist Workforce Survey and to the 2009 National Pharmacy Practice Survey were somewhat similar in terms of degrees earned and practice setting. However, by targeting pharmacy practice faculty, the National Pharmacy Practice Survey sample may be an overestimate of the proportion of pharmacists practicing in academia. In addition, NABP sought to include representative samples of practitioners working in inpatient and outpatient settings. Table 2 presents the demographic characteristics of the pharmacist samples responding to each of the survey instruments. Direct comparisons of practice setting with the National Pharmacist Workforce Survey are difficult because of crossover in categorizing the settings.

In future analyses, the sample population may need to account for factors such as gender, geographical distribution, and years in practice. Therefore, the results of this study may not be generalizable beyond the present sample if selection bias is indeed present, thus limiting the interpretation of outcomes.

When pharmacists assigned ratings to the 43 competency statements, there was variability in terms of their criticality measures (some statements ranked considerably higher than others). Evaluation of the hierarchy of competencies will provide insight for future pharmacist competency reviews. The competencies deemed most critical to entry-level practice when rank ordered from the 2009 survey included: the ability to evaluate contraindications, duplications, and interactions in medication therapy; accuracy in pharmaceutical calculations; the management of adverse reactions; patient assessment; and recommendations for appropriate therapy for specified conditions. Following the trends of pharmacists’ expectations over time is a valuable tool for shaping educational and regulatory objectives.

Table 1. Pharmacists’ Measures of the Criticality of Competencies for Entry-Level Practice

Fixed Effect	Coefficient	SE	P
Degree, γ_{01}	0.152	0.043	0.001
In-Patient, γ_{02}	0.248	0.168	0.14
Out-Patient, γ_{03}	0.162	0.180	0.37
Academic, γ_{04}	0.160	0.171	0.35
Preceptor, γ_{05}	0.068	0.060	0.26

Table 2. A Comparison of the Demographic Characteristics of Pharmacists Responding to the Pharmacists Responding to the 2009 National Pharmacist Practice Survey and the 2009 National Pharmacist Workforce Survey^a

	2009 National Pharmacist Workforce Survey (N=1,395), %	2009 National Pharmacist Practice Survey (N=2,865), %
Degree		
BS in Pharmacy	66.3	48
PharmD degree	21.6	34
BS in Pharmacy and a PharmD degree	N/A ^b	16
No response		2
Gender		
Male	53.6	43.4
Female	46.4	53
No response		3.6
Practice Setting		
Inpatient	30	40.9
Outpatient	59.9	46.6
Not involved in direct patient care	8.6	3.6
Academician	1.5	8.9
Preceptor Experience		
Experience currently or within the 5 years preceding the survey		82
Race/Ethnicity		
White	86.5	77.4
Asian/Pacific Islander	8.1	9.1
Black	2	3.1
Hispanic	1.7	2.1
American Indian/Alaskan Native	0.4	0.5
Other	1.3	2.4
No response		5.3

Abbreviations: BS = bachelor of science; PharmD = doctor of pharmacy.

^a The information provided in this table regarding the degrees of pharmacists who responded to the 2009 National Pharmacist Workforce Survey (NPWS) was taken from the Final Report of the 2009 National Pharmacist Workforce Survey¹⁰ and was not used in the National Pharmacist Practice Survey analysis.

^b The NPWS collected only the highest degree held, so this category was not applicable.

CONCLUSION

The purpose of this study was to determine whether defined subgroups of pharmacists held different views regarding the criticality of the various competencies defined for entry-level pharmacy practice. The study showed alignment among practitioners with regard to expectations for competence. Despite its limitations, this analysis can serve as a starting point to study the evolving expectations for entry-level pharmacist practitioners over time. Stakeholders in pharmacy education and regulation have vested interests in the alignment of the education of future practitioners with the expanding needs of the profession and the mission to protect the public.

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Appendix 1. Rating scales used in the 2009 National Pharmacy Practice Survey

Criticality	Frequency
1 = Not serious (eg, has no effect)	Very rarely (eg, monthly or less)
2 = Minimally serious (eg, causes inconvenience)	Rarely (eg, weekly)
3 = Moderately serious (eg, hinders therapeutic progress or may endanger public health and safety)	Occasionally (eg, daily)
4 = Highly serious (eg, worsens the patient's condition or is likely to endanger public health and safety)	Often (eg, hourly)
5 = Critically serious (eg, is life threatening or will definitely endanger public health and safety)	Very often (eg, many times per hour)

Appendix 2. Description of Variables

Variable	Description
Bachelor of Science (BS)	5-year professional program; with the last US classes graduating in 2006. Current entry-level in Canada.
Doctor of Pharmacy (PharmD)	6-year professional program; currently only entry-level degree available in the United States. Available in Canada as a post-baccalaureate degree.
Inpatient	Primary practice involves patient care in an in-patient setting (hospital, short and long-term care facilities).
Outpatient	Primary practice involves patient care in an out-patient setting (community, outpatient clinical, collaborative practice).
No-Patient	Primary practice involves no direct patient care (administrative, consulting, regulatory).
Academic	Primary practice is in education.
Preceptor	Either BS or PharmD entry-level degree, various practice settings, advanced pharmacy practice.